Central Inverter

SUNNY CENTRAL 250U / 500U / 500HE-US

User Manual

SCUS-BUS094812 | 98-4000612 | Version 1.2

US

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions for Models SC 250U / SC 500U / SC 500HE-US PV INTERACTIVE INVERTERS, that shall be followed during installation and maintenance of the inverter.

The Sunny Central is designed and tested according to international safety requirements, but as with all electrical and electronic equipment, certain precautions must be observed when installing and/or operating the Sunny Central. To reduce the risk of personal injury and to ensure the safe installation and operation of the Sunny Cetral, you must carefully read and follow all instructions, cautions and warnings in this Installation Guide.

Warnings

A Warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the SMA equipment and/or other equipment connected to the SMA equipment or personal injury.

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE indicates a situation that can result in property damage if not avoided.

Other Symbols

In addition to the safety and hazard symbols described on the previous pages, the following symbol is also used in this Installation Guide:

Information

This symbol accompanies notes that call attention to supplementary information that you should know and use to ensure optimal operation of the system.

Markings on this Product

The following symbols are used as markings on this product with the following meanings.

Warning regarding dangerous voltage

The product works with high voltages. All work on the product may only be done as described in its documentation.

Beware of hot surface

The product can become hot during operation. Avoid coming into contact with the product during operation.

Observe the operating instructions

Read the product's documentation before working on it. Follow all safety precautions and instructions as described in the documentation.

DC current

Earth Ground

AC current

UL1741 is the standard applied by Underwriters Laboratories to the Sunny Central to certify that it meets the requirements of the NEC and IEEE-929-2000. IEEE 929-2000 provides recommendations regarding the proper equipment and functionality necessary to ensure compatible operation when power generation is connected to the utility grid.

General Warnings

General Warnings

All electrical installations must be done in accordance with the local and National Electrical Code ANSI/NFPA 70.

The Sunny Central contains no user-serviceable parts. For all repair and maintenance always contact an authorized SMA Service Center.

Before installing or using the Sunny Central, read all of the instructions, cautions, and warnings on the Sunny Central, the PV array, in this Installation Guide and in the User Manual.

Before connecting the Sunny Central to the electrical utility grid, contact the local utility company. This connection must be made only by qualified personnel.

PV arrays produce electrical energy when exposed to light and thus can create an electrical shock hazard. Wiring of the PV-arrays should only be performed by qualified personnel.

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1 Information on this Manual

This document describes the operation, maintenance and failure correction of the Sunny Central 250U, Sunny Central 500U and Sunny Central 500HE-US. This manual does not cover any details concerning PV modules. Information concerning the PV modules is available from the manufacturer of the PV modules.

1.1 Target Group

This manual is for the installer, the maintenance personnel and the operator of a Sunny Central 250U, Sunny Central 500U and Sunny Central 500HE-US. The installer, the maintenance personnel and the operator of the Sunny Central have to be qualified personnel. Qualified personnel has received training and has demonstrated skills and knowledge in the construction and operation of the device. Qualified personnel is trained to deal with the dangers and hazards involved in installing electric devices.

1.2 Validity

This manual applies for the Sunny Central 250U, Sunny Central 500U and Sunny Central 500HE-US from the BFR firmware version 1.030 and the DSP firmware version 1.030. In this manual the Sunny Central 250U, Sunny Central 500U and Sunny Central 500HE-US are referred to as "Sunny Central".

2 Safety Instructions

DANGER

High voltages are present in the live components of the medium voltage grid.

Death resulting from burning and electric shock.

- Do not touch the live components of the medium voltage grid or the inverter.
- Pay close attention to all safety precaution measures regarding the medium voltage grid.

WARNING

Failure to follow the manual, the operating instructions and the safety precautions may lead to severe injury from electric shock.

- All work on the Sunny Central may only be done as described in this manual.
- Pay attention to all safety instructions.
- Follow all operating instructions.
- If problems occur when performing the work described here, contact SMA America.

WARNING

Operating a damaged Sunny Central may cause severe injury from electric shock.

- The Sunny Central may only be used when it is technically faultless and safe to operate.
- Operate the Sunny Central only if there are no visible damages.
- Regularly check the Sunny Central for visible damage.
- Ensure that all external safety features are freely accessible at all times, and that they are regularly tested for correct functionality.

Storage of handbooks

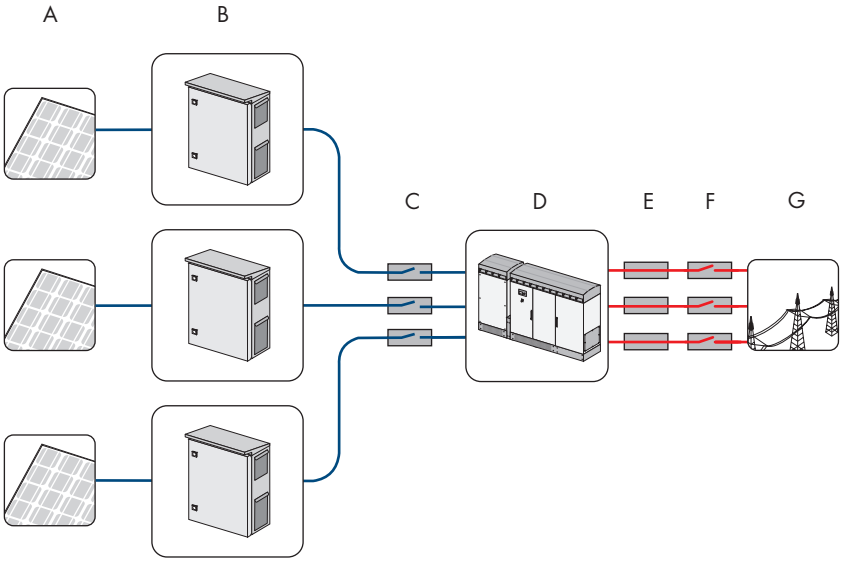
This documentation must be kept in the immediate vicinity of the Sunny Central. It must be accessible to service and maintenance personnel at any time.

Do not store this documentation or other papers in the Sunny Central.

3 Description of the Sunny Central

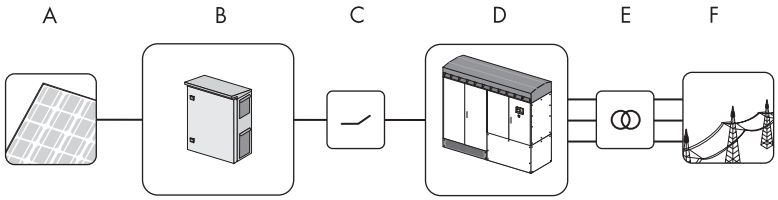
The Sunny Central is a PV inverter that converts the DC energy from PV modules to AC energy. This energy is then fed to the public grid. The Sunny Central is designed for indoor and outdoor installation.

Principle of a PV Power System with a Sunny Central 250U or Sunny Central 500U



Position	Description
A	PV modules
B	DC distribution with DC fuses (e.g., Sunny Central String-Monitor)
C	DC disconnect
D	Sunny Central
E	AC fuse
F	AC disconnect
G	Public grid

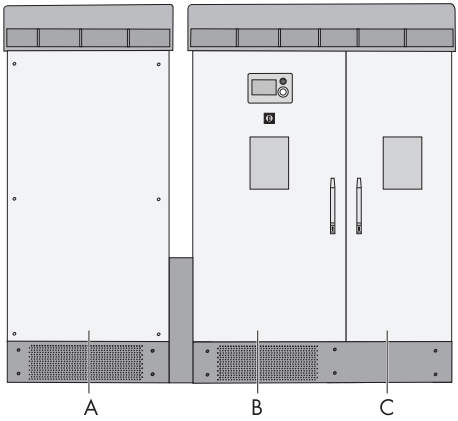
Principle of a PV Power System with a Sunny Central 500HE-US



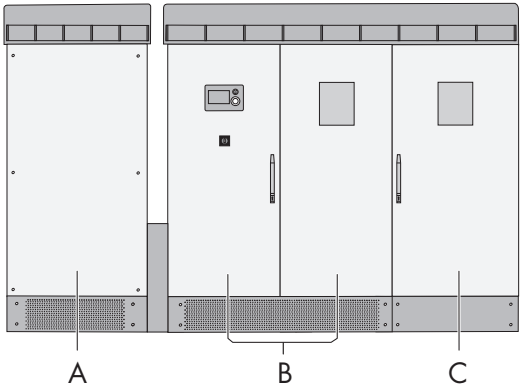
Position	Description
A	PV modules
B	DC distribution with DC fuses (e.g., Sunny Central String-Monitor)
C	DC disconnect
D	Sunny Central
E	Transformer
F	Public grid

3.1 Design of the Sunny Central

Sunny Central 250U

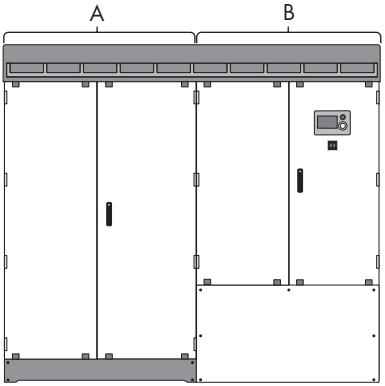


Sunny Central 500U



Position	Cabinet	Description
A	Magnetics Cabinet	The Sunny Central's transformer is contained in the Magnetics Cabinet.
B	Control Cabinet	The Control Cabinet contains the system control, the Sunny Display, the stop/start switch and the stacks for converting direct current to alternating current.
C	Interface Cabinet	All AC, DC and data cables are connected in the Interface Cabinet.

Sunny Central 500HE-US

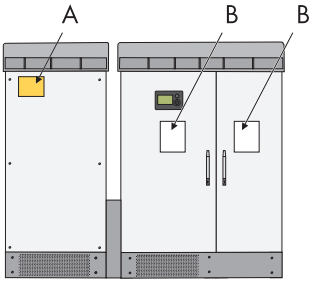


Position	Cabinet	Description
A	Power Cabinet	The power cabinet contains the power unit for converting direct current to alternating current.
B	Control and Interface Cabinet	All AC, DC and communication cables are connected in the control and interface cabinet. The control and interface cabinet contains: • system control • Sunny Display • stop/start switch • optional communication devices

3.2 Location of the Safety Instructions

Sunny Central 250U

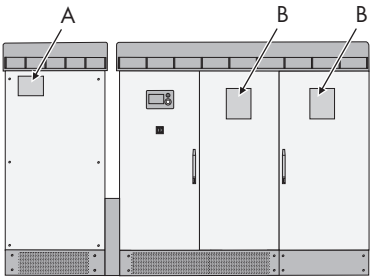
The figure to the right shows the location of the safety instructions on the Sunny Central 250U.



Position	Description
A	Wall of the Magnetics Cabinet General warnings
B	Door of the Control Cabinet and Interface Cabinet Warning regarding high voltages in the Sunny Central.

Sunny Central 500U

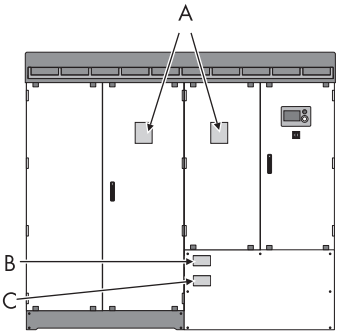
The figure to the right shows the location of the safety instructions on the Sunny Central 500U.



Position	Description
A	Wall of the Magnetics Cabinet General warnings
B	Door of the Control Cabinet and Interface Cabinet Warning regarding high voltages in the Sunny Central.

Sunny Central 500HE-US

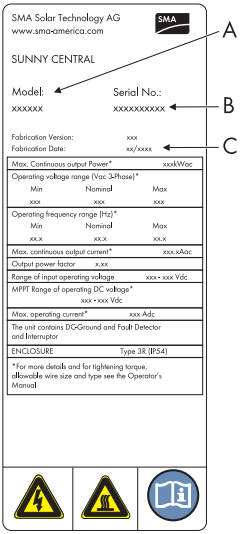
The figure to the right shows the location of the safety instructions on the Sunny Central 500HE-US.



Position	Description
A	Warning regarding high voltages in the Sunny Central.
B	Warning regarding hazardous voltage.
C	Notice regarding operation of the Sunny Central without transformer.

3.3 Identifying the Sunny Central

You can identify the Sunny Central using the type plate (see figure at right, example for a typeplate of the Sunny Central 500U). The type plate is located in the Interface Cabinet.



Position	Description
A	Type description of the Sunny Central
B	Serial number of the Sunny Central
C	Date of manufacture

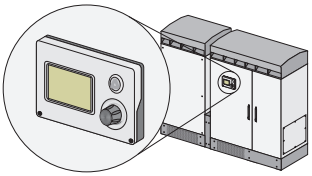
3.4 Firmware

You can use the display to call up the firmware version of the Sunny Central and of the display (see Section 4.7 "Display Firmware Version" (page 24)).

3.5 Elements for Sunny Central Operation

3.5.1 Sunny Display

There is a display on the front side of the Sunny Central. The display shows the current values of the PV power system. See Section 4 "Operating the Sunny Display" (page 18).



3.6 Optional Accessories

The Sunny Central can be equipped with various communication and data acquisition devices.

Sunny WebBox

The Sunny WebBox collects the data from the Sunny Central continuously. To read the data, the Sunny WebBox can be connected to a laptop or PC. The data can be processed with Sunny Portal, for example.

Sunny SensorBox

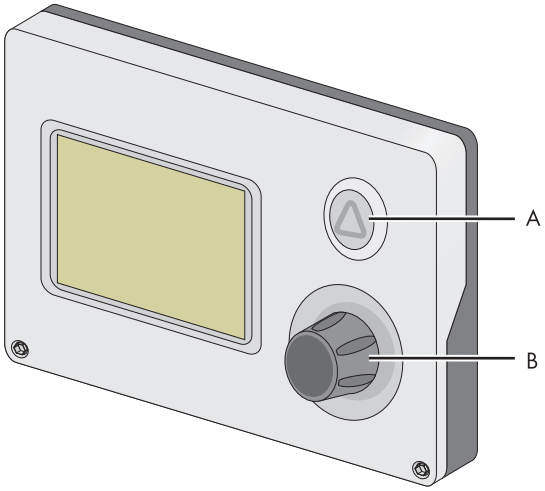
The Sunny SensorBox and the sensors enable you to acquire environmental data of your PV power system which are relevant for performance evaluation. For this purpose, the Sunny SensorBox is equipped as standard with an integrated irradiation sensor and an external module temperature sensor. The Sunny SensorBox delivers the sensor data via an RS485 interface to the SMA communication devices (e.g. Sunny WebBox).

Power Metering (not for Sunny Central 500HE-US)

The Shark power meter and iLon device are a revenue grade metering system. They allow the output generation of the inverter to be monitored and recorded. This information is sent via the internet to a network that can process the data into a utility bill.

4 Operating the Sunny Display

4.1 Functions of the Buttons



Position	Description
A	Pushbutton
B	Knob

The display can be operated with a pushbutton and a knob.

Pushbutton

If an error occurs during operation, the pushbutton is backlit red. The display indicates the error with a number and a description in the text line.

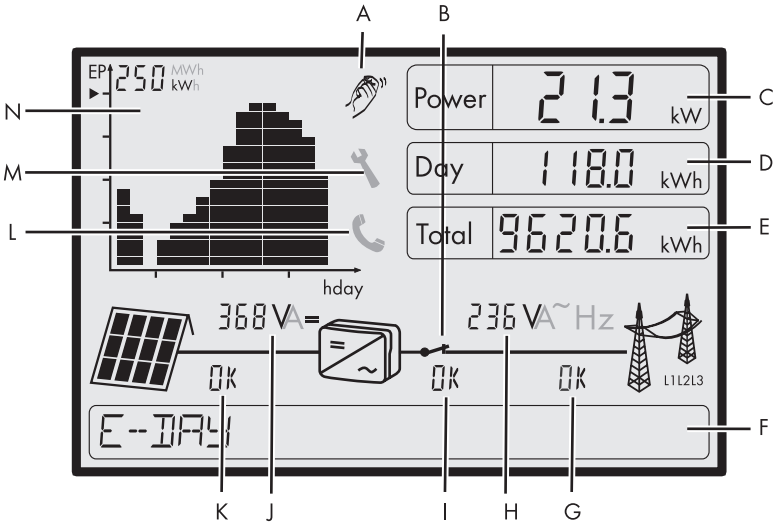
Knob

The knob can be pressed or turned to the left or the right.

- Turn:
  - Moves up and down in the menu
  - Entering values (decrease, increase)
- Press
  - Open/close menu
  - Select/cancel function
  - Select value
  - Confirm entry
  - Activation of the background illumination

4.2 Description of Display Symbols

The following figure is an example for the Sunny Central 250U.



Postion	Description
A	Tapping The background illumination is switched on by tapping on the housing cover.
B	Open switch: The Sunny Central is not feeding the grid (e.g., at night). Closed switch: The Sunny Central is feeding the grid.
C	Power This displays the power which the Sunny Central is feeding into the grid. The display is updated every 5 seconds.
D	Day The energy fed into the grid on this day is displayed here. This is the energy generated from the moment the Sunny Central begins to operate to the moment of the reading. The display is updated every 5 seconds.
E	Total This displays the total energy which the Sunny Central has fed into the grid during its operating time. The display is updated every 5 seconds.
F	Text line The text line shows the menu and a plain text error description. For example, if there is an error, the cause of the error is shown in the text line. In addition, the display shows the respective error number in position G, I or K.

Postion	Description
G	Event number grid If there is a failure in the AC grid, an error number will be shown in this position. In addition, a plain text message will be shown in the text line (position F). See Section 7 "Error Diagnosis" (page 31).
H	Grid voltage, grid frequency, grid current Changing display between: • Grid voltage • Grid frequency • Grid current (average over all three phases) The display changes between the values every 2 seconds.
I	Event number Sunny Central If there is an error in the Sunny Central, an error number will be shown in this position. In addition, a plain text message will be shown in the text line (position F). See Section 7 "Error Diagnosis" (page 31).
J	PV voltage, PV current This displays the PV voltage and PV current in alternation. The display changes between the values every 2 seconds.
K	Event number PV generator If there is a failure in the PV generator, an error number will be shown in this position. In addition, a message in plain text will be shown in the text line (position F). See Section 7 "Error Diagnosis" (page 31).
L	Errors This symbol is illuminated if an error occurs. Contact the SMA Serviceline, see Section 9 "Contact" (page 42).
M	Errors This symbol is illuminated if an error occurs. In Section 7 "Error Diagnosis" (page 31) it is described how this error can be rectified.
N	Graphic display of the output power of the Sunny Central The output power of the Sunny Central is shown in a chart in the display. The daily graph is displayed by default. Also see Section 4.4 "Switching the display" (page 21). The column for the current hour is adjusted every five seconds.

4.3 Navigating through the Menu

You can navigate through the menu using the knob and the pushbutton on the Sunny Display.

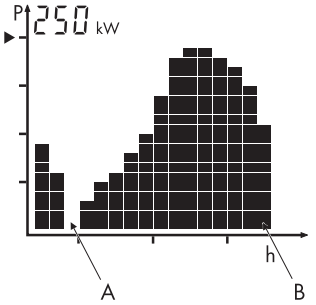
Action	Procedure
Change menu item	Turn knob.
Select menu	Press knob once.
Leave menu	Turn the knob until the text line reads "BACK". Press the knob. The Sunny Display changes to the outer menu.
Confirm entry	Press knob once.
Increase / decrease values.	Turn knob.

4.4 Switching the display

You can view the hourly graph or the daily graph in the display. The display shows the hourly graph by default. The current hour or the current day is the right column of the chart. With every new hour or new day, the chart moves further to the left, out of the screen. In total the display can show 16 hours or 16 days.

E-DAY

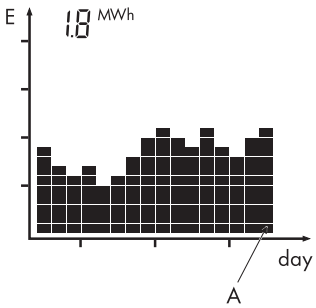
E-DAY charts the hours and indicates the maximum power output of the day. When no energy is fed into the grid (at night, for example) a gap is inserted in the chart. The gap is the same width as a column.



Position	Description
A	No energy is fed into the grid
B	Current hour

E-HISTORY

E-HISTORY is the chart of the last 16 days. The daily chart displays the energy which the Sunny Central fed into the grid on the respective days.



Position	Description
A	Current day

Switching between E-DAY and E-HISTORY

You change the display by turning the knob.

Turn the knob to the left: E-HISTORY

Turn the knob to the right: E-DAY

4.5 Menu Overview

The menu of the Sunny Display is subdivided into two menu items. To access the menu, proceed as follows:

1. Keep the knob and the pushbutton pressed for 2 seconds.

☑ The Sunny Display changes to the main menu.

Menu 1st level	Menu 2nd level	Menu 3rd level	Menu 4th level
SETTINGS	CURRENT TIME		
	TIME SETTINGS	SET CURRENT TIME	HOUR
			MIN
			BACK
		SET CURRENT DATE	YEAR
			MONTH
			DAY
			BACK
		BACK	
	BACK		
INFO	VERSION BFR		
	VERSION DSP		
	VERSION DISPLAY		
	VERSION LCD		
	BACK		
BACK			

4.5.1 Description of Menu Items

SETTINGS In the Settings menu you can adjust the settings on the display (e.g. date and time settings) and display the current time.

- CURRENT TIME Displays the current time.
- TIME SETTINGS In this menu you can change the time and the date (see Section 4.6 "Changing the Date and Time" (page 23)).

INFO The Info menu displays the firmware numbers of the Sunny Display and the Sunny Central.

- VERSION BFR Displays the firmware number of the Sunny Central operation control unit (BFR).
- VERSION DSP Displays the firmware number of the Sunny Central Digital Signal Processor (DSP).
- VERSION DISPLAY Displays the firmware version of the Sunny Display.
- VERSION LCD Displays the firmware number of the Sunny Display LCD.

4.6 Changing the Date and Time

If a Sunny WebBox is not built into the Sunny Central, you can change the date and time on the Sunny Display. If you wish to change the date or the time (e.g. from summer to winter time), proceed as follows:

4.6.1 Changing the Time

1. Keep the knob and the pushbutton pressed for 2 seconds.
2. Turn the knob until the text line displays "SETTINGS".
3. Press the knob once.

   The Sunny Display changes to the "SETTINGS" menu.
4. Turn the knob until the text line displays "TIME SETTINGS".
5. Press the knob once.

   The Sunny Display changes to the "TIME SETTINGS" menu.
6. Turn the knob until the text line displays "SET CURRENT TIME".
7. Press the knob once.

   The Sunny Display changes to the "SET CURRENT TIME" menu. You can set the hours and minutes in this menu.
   - HOUR: Current hour. The time is shown in 12-hour format.
   - MIN: Current minute.
8. Turn the knob until the text line displays "HOUR", for example.
9. Press the knob once.

   The Sunny Display changes to the "HOUR" menu item.

10. Turn the knob until the text line displays the desired hour.
11. Press the knob once to confirm and save the current value.

    The Sunny Display springs back to the "SET CURRENT TIME" menu. The value (in this case the hour) is set.
12. To set the minute, proceed as described in point 9. Select "MINUTE" instead of "HOUR".

4.6.2 Changing the Date

13. Follow points 1 through 6 in chapter 4.6.1 ”Changing the Time” (page 23).
14. Turn the knob until the text line displays "SET CURRENT DATE".
15. Press the knob once.

    The Sunny Display changes to the "SET CURRENT DATE" menu. You can set the year, month and day in this menu.
    - YEAR: Current year.
    - MONTH: Current month.
    - DAY: Current day.
16. Turn the knob until the text line displays "YEAR", for example.
17. Press the knob once.

    The Sunny Display changes to the "YEAR" menu item.
18. Turn the knob until the text line displays the desired year.
19. Press the knob once to confirm and save the desired value.

    The Sunny Display springs back to the "SET CURRENT DATE" menu. The value (in this case the year) is set.
20. To set the month and day, proceed as described in point 4. Select "MONTH" or "DAY" instead of YEAR.

4.7 Display Firmware Version

You can display the firmware versions of the Sunny Central and the Sunny Display as follows:

1. Keep the knob and the pushbutton pressed for 2 seconds.
2. Turn the knob until the text line displays "INFO".
3. Press the knob once.

   The Sunny Display changes to the "INFO" menu. In this menu you can select the firmware versions and version numbers.
   - VERSION BFR: firmware version of the Sunny Central operation control unit (BFR).
   - VERSION DSP: firmware version of the Sunny Cetral Digital Signal Processor (DSP).
   - VERSION DISPLAY: firmware version of the Sunny Display.
   - VERSION LCD: firmware version of the Sunny Display LCD.
4. Turn the knob until the text line of the event display reads "VERSION BFR", for example.

5. Press the knob once.
   The Sunny Display shows the version number of the operation control unit.
6. Press the knob once to spring back one level.

5 Spot Values

The following table shows the spot values that are visible to the user. The spot values are part of the channel list and display the Sunny Central's status.

Name	Description
Cntry	Country code
Dsc	Error description
ErrNo	Display of error number
Error	Identification of the error „Photovoltaic", „Inverter" or „Grid"
E-heute	Energy generated today
E-Total	Total amount of energy fed into the grid.
Fac	AC frequency
Firmware	Firmware version of the operation control unit (BFR)
Firmware-2	Firmware version of the digital signal processor (DSP)
Firmware-3	Operation control unit boot loader
Firmware-4	Digital signal processor boot loader
Firmware-5	Version of I/O-unit
GdCtcStt	Display of a symbol indicating whether the Sunny Central is feeding into the grid.
h-On	h-on indicates how long sufficient DC voltage has been applied to the Sunny Central and the Sunny Central has been active including the time it was not able to feed to the utility with respect to low DC voltage or operation in stop mode.
h-Total	Total number of grid-feeding operational hours
Iac	AC current (active current)
Ipv	DC current
Mode	Display of the current operating mode.
Msg	Message The display indicates how to proceed.
Pac	Generated AC power
Ppv	DC power

Name	Description
Prio	Priority The following appears on the display: • Wrench (the Sunny WebBox shows plain text message „Prio_B“): In section 7 ”Error Diagnosis” (page 31) it is described how this error can be rectified. **or** • Telephone receiver (the Sunny WebBox shows plain text message „Prio_A“): Contact the SMA Serviceline, see section 8 ”Contact” (page 39).
Qac	AC reactive power
SerTm	Current time in seconds since 01.01.1970
SN_BFS	Serial number of BFS
TmsRmg	Remaining time until the Sunny Central restarts.
Type	Inverter type
Vac	AC voltage
Vpv	DC input voltage

6 Parameters

6.1 Description of Parameters

The following table shows the parameters that are visible to the user. The installation guide of the Sunny Central also shows the parameters that are visible to the installer.

Parameter Name	Range	Default	Parameter Description
Ackn	---, Ackn, NoAckn	---	Acknowledge an error manually You can acknowledge an error with the optional Sunny WebBox. Refer to Section 7.1.6 "Acknowledge the Error with the Sunny WebBox" (page 38).
Dt	yyyymmdd		Current Date. Here you can set the current date.
Ofs_E-Total	0 ... 214748364 kWh	0 kWh	The Sunny Central's total energy yield Changing the Ofs_E_Total parameter may be necessary if you exchange the computer assembly (BFR) of the Sunny Central and want to transfer the data from the old device.
Ofs_h-On	0 ... 2147483 h	0 h	The Sunny Central's total number of hours of operation Changing the Ofs_h_On parameter may be necessary if you exchange the computer assembly (BFR) of the Sunny Central and want to transfer the data from the old device.
Ofs_h-Total	0 ... 2147483 h	0 h	Total number of operational hours with grid feeding Changing the Ofs_h_Total parameter may be necessary if you exchange the computer assembly (BFR) of the Sunny Central and want to transfer the data from the old device.
Plimit	0 ... 1000 kW	250 kW (SC250U) 500 kW (SC500U) 500 kW (SC500HE-US)	Upper limit for AC output power This parameter cannot be changed.

Parameter Name	Range	Default	Parameter Description
Pmax	0 ... 250 kW (SC250U) 0 ... 500 kW (SC500U) 0 ... 500 kW (SC500HE-US)	250 kW (SC250U) 500 kW (SC500U) 500 kW (SC500HE-US)	Output limit of the Sunny Central The output power of the Sunny Central can be reduced with this parameter.
PVPwrMinTr	0 ... 1200 kW	10 kW (SC250U) 20 kW (SC500U) 20 kW (SC500HE-US)	MPP tracking If the output exceeds the value PVPwrMinTr, the Sunny Central will wait for the period of time set in PVPwrMinTrT before it begins to seek the Maximum Power Point.
PVPwrMinTrT	1 ... 1800 s	600 s	
PVStrT	1 ... 1800 s	90 s	Initial voltage of the Sunny Central If the voltage increases over the value set at PVVtgStr, the Sunny Central will start after waiting for the period of time set at PVStrT.
PVVtgStr	0 ... 1200 V	390 V	
Serial Number			Serial number of the Sunny Central. This parameter cannot be changed.
SpntRemEna	---, Off, On	On	Switching off the Sunny Central With this parameter you can switch off the Sunny Central via the remote access.
Tm	hhmmss		Current Time. Here you can set the current time.

6.2 Changing Parameters

DANGER

Danger to life through changing the internal safety specifications of the Sunny Central.

- Parameters may only be changed with the express authorization of the grid operator and SMA America.

If a Sunny WebBox is installed in the Sunny Central, you can change the parameters of the Sunny Central via remote access from a PC or laptop. If you want to change the parameters of a Sunny Central without an inbuilt Sunny WebBox, contact SMA America.

Change the parameters as described in the following:

1. Open Internet browser.
2. Enter the Sunny WebBox IP address.

   The Sunny WebBox interface appears in the browser.
3. Enter the user or installer password. The parameters are displayed depending on the password level.
4. Select Sunny Central from the selection list to the left.
5. Select the "Parameter" tab.

   ☑ The browser displays the parameter list of the Sunny Central.
6. Select and change the desired parameter.
7. Go to the bottom of the parameter list and click on "Save".

☑ The parameter changes after 2 seconds.

7 Error Diagnosis

If the Sunny Central detects a fault during operation, it shows the fault in the display. Faults are indicated with a two-digit error code, a plain text message in the text line, a symbol in the display and a glowing pushbutton. This section describes how to recognize the type of fault and how you can rectify it. For the user of the Sunny Central this section should only be used for diagnosing a fault.

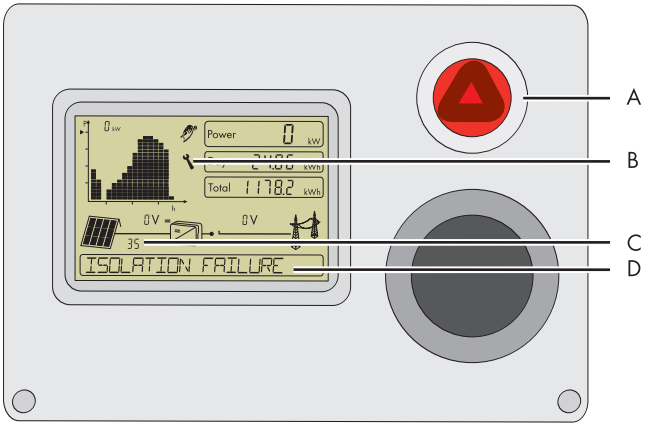
DANGER

Even in the case of a fault the Sunny Central can still contain high voltages.

Risk of death from electric shock.

- All procedures described in this section may only be carried out by qualified personnel.
- All the safety instructions in the installation guide and user manual must be observed when working on the Sunny Central.
- Contact SMA America if you cannot rectify the fault with the help of this manual.

Example of an Isolation Failure



A The pushbutton glows to indicate a failure.

B Symbol for a failure (in this case a wrench)

C Error number (here: isolation failure)

D Plain text message in the text line

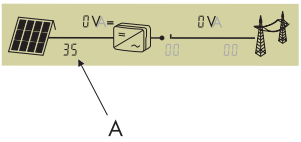
7.1 Diagnosis

The displayed faults are divided into the three areas of the PV system:

- PV generator (see Section 7.1.1 "PV Generator Fault" (page 32)).
- Sunny Central (see Section 7.1.2 "Sunny Central Fault" (page 33)).
- Grid (see Section 7.1.3 "Grid Fault" (page 35)).

7.1.1 PV Generator Fault

If the fault is on the PV generator side, a two-digit error code appears on the left side of the system display (see figure to the right: A). With this error number you can narrow down the type of malfunction. The table below describes the type of fault, its cause and what you can do to rectify the fault.

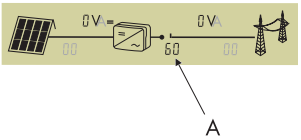


No.	Description
34	**Error text:** DC-Overvoltage **Cause of fault:** The voltage of the PV generator is too high. **Corrective measures:** • **Immediately disconnect the PV generator from the Sunny Central! The Sunny Central can be damaged by the high input voltage.** • Check the input voltage. • Check module wiring and system design.
35	**Error text:** Ground Fault **Cause of fault:** The PV generator has a connection to ground. **Corrective measure:** • Check the PV generator for a ground fault.

No.	Description
38	**Error text:** DC-Overcurrent **Cause of fault:** The current of the PV generator is too high. **Corrective measures:** • **Immediately disconnect the PV generator from the Sunny Central! The Sunny Central can be damaged by the high input current.** • Check the input current. • Check module wiring and system design.

7.1.2 Sunny Central Fault

If the fault is with the Sunny Central, a two-digit error code appears in the middle of the system display (see figure to the right: A). With this error number you can narrow down the type of malfunction. The table below describes the type of fault, its cause and what you can do to rectify the fault.



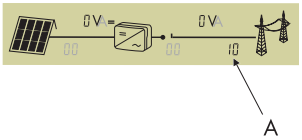
No.	Description
60	**Error text:** Device Fault **Cause of fault:** • Internal fault of the Sunny Central. **Corrective measures:** • Contact the SMA Serviceline.
61	**Error text:** Device Fault **Cause of fault:** Internal fault of the Sunny Central. **Corrective measures:** • Contact the SMA Serviceline.
64	**Error text:** Device Fault **Cause of fault:** Internal fault of the Sunny Central. **Corrective measures:** • Contact the SMA Serviceline.

No.	Description
65	**Error text:** Overtemperature **Cause of fault:** The ambient temperature is too high. **Corrective measures:** • Check functionality of fan. • Clean the fan. • Clean dirty fan inlets and the ventilation plate.
70	**Error text:** Temperature sensor failure **Cause of fault:** • Cable break • Short circuit • Internal fault of the Sunny Central. **Corrective measures:** • Check the cabling of the temperature sensor. • Contact the SMA Serviceline.
75	**Error text:** Fan failure **Cause of fault:** The ambient temperature is too high. **Corrective measures:** • Check functionality of fan. • Clean the fan. • Clean dirty fan inlets and the ventilation plate.
76	**Error text:** Communication failure **Cause of fault:** Internal fault of the Sunny Central. **Corrective measures:** • Contact the SMA Serviceline.

No.	Description
77	**Error text:** Device fault **Cause of fault:** Contactor defective. **Corrective measures:** • Contact the SMA Serviceline.
78	**Error text:** Surge voltage arrestor failure **Cause of fault:** Surge error. **Corrective measures:** • Check surge voltage arrestor.
79	**Error text:** Reverse current failure **Cause of fault:** Short circuit in the PV generator. **Corrective measures:** • Check the PV generator for short circuits.

7.1.3 Grid Fault

If the fault is on the grid side, a two-digit error code appears on the right side of the system display (see figure to the right: A). With this error number you can narrow down the type of malfunction. The table below describes the type of fault, its cause and what you can do to rectify the fault.



No.	Description
01	**Error text:** Grid fault **Cause of fault:** The grid voltage is too high. **Corrective measures:** • Check the grid voltage. • If the grid voltage lies outside the acceptable range because of local grid conditions, ask the grid operator if the voltages can be adjusted at the feed-in point.

No.	Description
02	**Error text:** Grid fault **Cause of fault:** The grid voltage is too low. **Corrective measures:** • Check the grid voltage. • If the grid voltage lies outside the acceptable range because of local grid conditions, ask the grid operator if the voltages can be adjusted at the feed-in point. • Check that the external fuses are functional. • Check that the AC cable is securely connected.
05	**Error text:** Grid fault **Cause of fault:** The grid frequency is outside the permitted range. **Corrective measures:** • Check grid frequency. • If the grid frequency lies outside the acceptable range because of local grid conditions, ask the grid operator if the frequency can be adjusted at the feed-in point. • Check that the external fuses are functional. • Check that the AC cable is securely connected.
08	**Error text:** Grid failure **Cause of fault:** One phase of the grid has failed. **Corrective measures:** • Check the grid voltage. • Check that the external fuses are functional. • Check that the AC cable is securely connected.
13	**Error text:** Grid installation failure **Cause of fault:** Counterclockwise phase sequence **Corrective measures:** • Check connection to the grid. • Check phase sequence.

7.1.4 Display Fault

If the fault is with the display, the cause of the fault appears in text line (see example to the right). A display fault is shown without a two-digit error code. The table below describes the type of fault, its cause and what you can do to rectify the fault.

No.	Description
none	**Error text:** NO COMMUNICATION **Cause of fault:** The display has received no data for 5 minutes. **Corrective measures:** • Check communication cable. • Check supply voltage of the operation control unit (BFR). • Check operating mode of the Display (see the Sunny Central installation guide). – WEBBOX: For this operating mode a Sunny WebBox has to be installed. – NO WEBBOX: No Sunny WebBox installed. • For operation with Sunny WebBox: Check function of the Sunny WebBox. • Contact the SMA Serviceline.

7.1.5 Acknowledge Error at the Sunny Display

Acknowledge the error as described in the following.

1. Rectify the error at the Sunny Central as described in section 7 "Error Diagnosis" (page 31).
2. Press the glowing pushbutton once.
   – After 2 seconds the error is acknowledged.

7.1.6 Acknowledge the Error with the Sunny WebBox

If a Sunny WebBox is installed in the Sunny Central, you acknowledge an error via a Sunny WebBox from a PC or Laptop. You will find an extensive description of the operation of the Sunny WebBox in the technical description of the Sunny WebBox.

The error can only be acknowledged in the installer mode. Proceed as follows:

1. Rectify the error at the Sunny Central as described in section 7 "Error Diagnosis" (page 31).
1. Open Internet browser.
2. Enter the Sunny WebBox IP address.

   The Sunny WebBox interface appears in the browser.
3. Enter the installer or user password. The parameters are displayed depending on the password level.
4. Select Sunny Central from the selection list to the left.
5. Select the "Parameter" tab.
   - The browser displays the parameter list of the Sunny Central.
6. Select the "Ackn" parameter.
7. Select "Ackn" from the menu list.
8. Go to the bottom of the parameter list and click on "Save".
   - The error is acknowledged.

8 Appendix - Glossary

AC

Abbreviation for "Alternating Current"

ANSI

Abbreviation for American National Standards Institute

BFR

Abbreviation for operation control unit

CANDI

Fimware version of internal CAN communication

CEC

Abbreviation for California Energy Commission

Crossover cable

A crossover cable is needed, for example, to connect two computers directly with one another. A crossover cable is an 8-wire twisted pair cable with an RJ45 plug on each end. In one of the plugs certain wires are interchanged.

DC

Abbreviation for "Direct Current"

Derating

A controlled reduction in performance, usually dependent on component temperatures. Compared with the normal process of completely shutting down the device, the negative effect on the external power network is reduced with derating.

DSP

Abbreviation for Digital Signal Processor

Energy

The energy is measured in Wh (watt hours), kWh (kilowatt hours) or MWh (megawatt hours). The energy is the power calculated over time. If, for example, your Sunny Central operates at a constant output of 150 kW for half an hour and then at a constant output of 250 kW for another half hour, it has fed 200 kWh of energy into the gird within that hour.

Ethernet

Ethernet is a cable-based data network technology for local data networks. It allows data exchange in the form of data frames between all devices connected to a local network (e.g. computer, printer).

Fast Ethernet

Fast Ethernet is a further development of Ethernet which works at 100 Mbit/s. Also see "Ethernet".

Maximum Power Point (MPP)

Operating point with the maximum output power. This operating point varies with the PV radiation and temperature conditions of the modules.

NEMA

Abbreviation for National Electrical Manufactures Association

NFPA

Abbreviation for National Fire Protection Association

Patch Cable

A patch cable is used, for example, to connect a computer to a switch or router. A patch cable is an 8-wire twisted pair cable with an RJ45 plug on each end.

Power

The power is measured in W (watts), kW (kilowatts) or MW (megawatts). Power is a present value. It displays the power the Sunny Central is currently feeding into the grid.

PV

Abbreviation for photovoltaic, designates the conversion of PV energy into electrical energy.

PV Cell

An electronic component which generates electrical energy when irradiated with sunlight. Since the voltage produced by a PV cell is very small (approx. 0.5 V), several PV cells are combined to form a PV module. The most common material presently used for PV cells is silicon, which is manufactured in different forms (monocrystalline, polycrystalline, amorphous).

PV Energy System

A PV power plant is a power plant in which a portion of the PV irradiation is converted to electrical energy by means of PV cells. The DC voltage won this way is converted to AC voltage by an inverter (for example, Sunny Central) and is fed into the electricity network.

PV Inverter

A device for converting the direct current (DC) from the PV generator into alternating current (AC), which is required by most normal household devices and especially for feeding energy into an existing supply grid.

PV Module

A collection of PV cells in a housing that protects the sensitive cells from mechanical stresses and allows easy installation.

PWM

Abbreviation for Pulse Width Modulation

Router

A router connects several computer networks together.

RS485

RS485 is an interface standard for cable-bound data transmission. RS485 allows communication with 50 inverters and communication devices over a distance of 4,000 ft.

String

Describes a group of PV modules connected in series.

Sunny Central

The Sunny Central is an inverter for large PV power systems. This inverter concept is one in which all PV modules are connected to each other (in series and/or parallel) and a single inverter is used for feeding energy into the grid.

Sunny Portal

Sunny Portal is a web-based service provided by SMA which offers the possibility of creating a personal Sunny Portal website on which the data pertaining to a photovoltaic plant can be displayed. Additionally, the Sunny Portal archives this data. The PV power system data is available worldwide over the Internet.

Sunny SensorBox

The Sunny SensorBox and the sensors enable you to acquire environmental data of your PV power system which are relevant for performance evaluation. For this purpose, the Sunny SensorBox is equipped as standard with an integrated irradiation sensor and an external module temperature sensor. The Sunny SensorBox delivers the sensor data via an RS485 interface to the SMA communication devices (e.g. Sunny WebBox).

Sunny Central String-Monitor

The DC cables from the PV generators are collected in the Sunny Central String-Monitor. The Sunny Central String-Monitor monitors the current of the PV modules and can detect failures, e.g., the failure of a module.

Sunny WebBox

The Sunny WebBox collects the data from the Sunny Central continuously. To read the data, the Sunny WebBox can be connected to a laptop or PC. The data can be processed with Sunny Portal, for example.

Switch

A switch is a network component which allows the connection of several computers or network segments in a local network.

THD

Abbreviation for Total Harmonic Distortion

9 Contact

If you have technical problems concerning our products, contact the SMA Serviceline. We require the following information in order to provide you with the necessary assistance:

- Inverter type
- Type and number of modules connected
- Serial number of the Sunny Central
- Error number of the Sunny Central
- Display of the Sunny Central

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